

## Claims

1. A method for removing partially carrier bound substances from blood comprising  
5 a blood circuit, a fluid circuit and a filter having a semipermeable membrane separating a fluid compartment from a blood compartment, where blood is directed through the blood compartment and a cleaning fluid is directed through the fluid compartment **characterized** in that
- 10 - a mass transfer coefficient  $k_oA$  of the filter is at least 2000 ml/min;
- a ratio between the mass transfer coefficient  $k_oA$  of the filter and a blood flow rate is at least 5;
- 15 - a cleaning fluid flow rate is at least 2000 ml/min; and
- a ratio between the cleaning fluid flow rate and the blood flow rate is at least 5.
2. A method according to claim 1 where
- 20 - the ratio between the mass transfer coefficient  $k_oA$  of the filter and the blood flow rate is at least 10; and
- the ratio between the cleaning fluid flow rate and the blood flow rate is at least  
25 10.
3. A method according to claim 1 or 2 where
- the mass transfer coefficient  $k_oA$  of the filter is at least 5000 ml/min; and
- 30 - the cleaning fluid flow rate is at least 5000 ml/min.

4. A method according to claim 1, 2 or 3 where the parameters are chosen in relation to the product of a blood flow rate  $Q_b$  and a factor  $\alpha$  denoting the total amount of substance to be removed in relation to the fraction dissolved in plasma and
- 5       - the mass transfer coefficient  $k_oA$  of the filter is at least 10% of this product; and
- the cleaning fluid flow rate is at least 10% of this product.
5. A method according to claim 4 where
- 10       - the mass transfer coefficient  $k_oA$  of the filter is at least 100% of this product; and/or
- the cleaning fluid flow rate is at least 100% of this product.
- 15       6. A method for removing partially carrier bound substances from blood comprising a blood circuit, a fluid circuit and a filter having a semipermeable membrane separating a fluid compartment from a blood compartment, where blood is directed through the blood compartment and a cleaning fluid is directed through
- 20       the fluid compartment characterized in that
- a mass transfer coefficient  $k_oA$  of the filter is at least 2000 ml/min;
- a ratio between the mass transfer coefficient  $k_oA$  of the filter and a blood flow
- 25       rate is at least 5; and
- the cleaning fluid contains a carrier that is able to bind the partially carrier bound substances in the blood.
- 30       7. A method for removing partially carrier bound substances from blood comprising a blood circuit, a fluid circuit and a filter having a semipermeable membrane separating a fluid compartment from a blood compartment, where blood is directed through the blood compartment and a cleaning fluid is directed through

the fluid compartment **characterized** in that

- the membrane has been pretreated with a fluid containing a carrier that is able to bind the partially carrier bound substances in the blood;

5

- a cleaning fluid flow rate is at least 2000 ml/min; and

- a ratio between the cleaning fluid flow rate and the blood flow rate is at least 10.

10

8. A method according to claim 6 where the membrane has been pretreated with a fluid containing a carrier that is able to bind the partially carrier bound substances in the blood.

15

9. A method according to claim 7 where the cleaning fluid contains a carrier that is able to bind the partially carrier bound substance in the blood.

10. A method according to any of claims 6, 7, 8 or 9 where the carrier is serum albumin.

20

11. A method according to claim 10 where the concentration of the serum albumin is above 10 g/l.

25

12. A method for removing partially carrier bound substances from blood comprising a blood circuit, a fluid circuit and a filter having a semipermeable membrane separating a fluid compartment from a blood compartment, where a mixture of blood and a cleaning fluid is directed through the blood compartment and a pressure gradient is applied across the membrane to create an ultrafiltration into the fluid compartment equal in size to the sum of a flow rate of the cleaning fluid and a desired weight loss rate of a patient **characterized** in that

30

- a water permeability coefficient  $L_p A$  of the filter is at least 10 ml/min/mm Hg;

- the cleaning fluid flow rate is at least 1000 ml/min; and

- a ratio between the cleaning fluid flow rate and a blood flow rate is at least 5.

5 13. A method according to any of claims 1-12, where the filter is replaced by several filters arranged in series or parallel, or a combination thereof.

14. A method according to any of claims 1-13 where the blood is heated before being returned to the patient.

10 15. A method according to claim 14 where the heating is performed in a final dialyzer along a blood path before the blood is returned to the patient.

15 16. A device adapted to remove partially carrier bound substances from blood comprising a blood circuit, a fluid circuit and a filter having a semipermeable membrane separating a fluid compartment from a blood compartment, where blood is directed through the blood compartment and a cleaning fluid is directed through the fluid compartment characterized in that

20 - a mass transfer coefficient  $k_oA$  of the filter is at least 2000 ml/min;

- a ratio between the mass transfer coefficient  $k_oA$  of the filter and a blood flow rate is at least 5;

25 - a cleaning fluid flow rate is at least 2000 ml/min; and

- a ratio between the cleaning fluid flow rate and the blood flow rate is at least 5.

17. A device according to claim 16 where

30 - the ratio between the mass transfer coefficient  $k_oA$  of the filter and the blood flow rate is at least 10; and

- the ratio between the cleaning fluid flow rate and the blood flow rate is at least

10.

18. A device according to claim 16 or 17 where

- 5       - the mass transfer coefficient  $k_oA$  of the filter is at least 5000 ml/min; and
- the cleaning fluid flow rate is at least 5000 ml/min.

10       19. A device according to claim 16, 17 or 18 where the parameters are chosen in relation to the product of a blood flow rate  $Q_b$  and a factor  $\alpha$  denoting the total amount of substance to be removed in relation to the fraction dissolved in plasma and

- the mass transfer coefficient  $k_oA$  of the filter is at least 10% of this product; and
- 15       - the cleaning fluid flow rate is at least 10% of this product.

20. A device according to claim 19 where

- 20       - the mass transfer coefficient  $k_oA$  of the filter is at least 100% of this product; and/or
- the cleaning fluid flow rate is at least 100% of this product.

25       21. A device adapted to remove partially carrier bound substances from blood comprising a blood circuit, a fluid circuit and a filter having a semipermeable membrane separating a fluid compartment from a blood compartment, where blood is directed through the blood compartment and a cleaning fluid is directed through the fluid compartment **characterized in that**

- 30       - a mass transfer coefficient  $k_oA$  of the filter is at least 2000 ml/min;
- a ratio between the mass transfer coefficient  $k_oA$  of the filter and a blood flow

rate is at least 5; and

- the cleaning fluid contains a carrier that is able to bind the partially carrier bound substances in the blood.

5

22. A device adapted to remove partially carrier bound substances from blood comprising a blood circuit, a fluid circuit and a filter having a semipermeable membrane separating a fluid compartment from a blood compartment, where blood is directed through the blood compartment and a cleaning fluid is directed through the fluid compartment **characterized** in that

10

- the membrane has been pretreated with a fluid containing a carrier that is able to bind the partially carrier bound substances in the blood;

15

- a cleaning fluid flow rate is at least 2000 ml/min; and

- a ratio between the cleaning fluid flow rate and the blood flow rate is at least 10.

20

23. A device according to claim 21 where the membrane has been pretreated with a fluid containing a carrier that is able to bind the partially carrier bound substances in the blood.

24. A device according to claim 22 where the cleaning fluid contains a carrier that is able to bind the partially carrier bound substances in the blood.

25

25. A device according to any of claims 21, 22, 23 or 24 where the carrier is serum albumin.

30

26. A device according to claim 25 where the concentration of the serum albumin is above 10 g/l.

27. A device adapted to remove partially carrier bound substances from blood comprising a blood circuit, a fluid circuit and a filter having a semipermeable

membrane separating a fluid compartment from a blood compartment, provided with means for mixing blood and a cleaning fluid and directing said mixture through the blood compartment, and means to apply a pressure gradient across the membrane to create an ultrafiltration into the fluid compartment equal in size to the sum of a flow rate of the cleaning fluid and a desired weight loss rate of the patient **characterized** in that

- a water permeability coefficient  $L_p A$  of the filter is at least 10 ml/min/mm Hg;

- the cleaning fluid flow rate is at least 1000 ml/min; and

- a ratio between the cleaning fluid flow rate and a blood flow rate is at least 5.

28. A device according to any of claims 16-27, where the filter is replaced by several filters arranged in series or parallel, or a combination thereof.

29. A device according to any of claims 16-28 where a heater is arranged for heating the blood before it is returned to the patient.

30. A device according to claim 29 where the heater is a final dialyzer along the blood path before the blood is returned to the patient.